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FLOOD INSURANCE STUDY

ORIGINAL

CITY OF LYNN HAVEN, FLORIDA

BAY COUNTY

APRIL 30, 1986

Federal Emergency Management Agency

COMMUNITY NUMBER - 120009

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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Purpose of Study	1
1.2	Authority and Acknowledgments	1
1.3	Coordination	1
2.0	AREA STUDIED	1
2.1	Scope of Study	1
2.2	Community Description	3
2.3	Principal Flood Problems	3
2.4	Flood Protection Measures	6
3.0	ENGINEERING METHODS	6
3.1	Hydrologic Analyses	6
3.2	Hydraulic Analyses	8
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	13
4.1	Flood Boundaries	13
5.0	INSURANCE APPLICATION	13
5.1	Reach Determinations	13
5.2	Flood Hazard Factors	13
5.3	Flood Insurance Zones	14
5.4	Flood Insurance Rate Map Description	16

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TABLE OF CONTENTS (Continued)

		Page
6.0	OTHER STUDIES	16
7.0	LOCATION OF DATA	16
8.0	REFERENCES AND BIBLIOGRAPHY	16

FIGURES

Figure 1 -	Vicinity Map	2
Figure 2 -	Historical Storm Tracks	4
Figure 3 -	Transect Location Map	10
Figure 4 -	Transect Schematic	11

TABLES

Table 1 -	Parameter Values for Surge Elevations	7
Table 2 -	Summary of Stillwater Elevations	9
Table 3 -	Transect Locations, Stillwater Starting Elevations, and Initial Wave Crest Elevations	12
Table 4 -	Coastal Flood Insurance Zone Data	15

EXHIBIT

Flood Insurance Rate Map

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FLOOD INSURANCE STUDY

CITY OF LYNN HAVEN,
BAY COUNTY,
FLORIDA

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Type 19 Flood Insurance Study is to investigate the existence and severity of flood hazards in the City of Lynn Haven, Bay County, Florida, and to aid in the administration of the Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to revise the Flood Insurance Rate Map developed from data presented in the Type 15 Flood Insurance Study. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The coastal storm surge analysis for this study was performed by Stottler, Stagg & Associates and GKY & Associates, Inc. (the Study Contractors) in a joint venture for the Federal Emergency Management Agency (FEMA), under Contract No. H-4780. The wave height analysis was performed by FEMA. This study was completed in October 1984.

1.3 Coordination

On June 11, 1985, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractors, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Lynn Haven, Bay County, Florida. The area of study is shown on the Vicinity Map (Figure 1).

A detailed coastal flooding analysis was performed on the complete coastline of the City of Lynn Haven, where the flooding source is North Bay.

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FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LYNN HAVEN, FL

(BAY CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

2

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through October 1989. The scope and methods of study were proposed to and agreed upon by FEMA and the City of Lynn Haven.

2.2 Community Description

The City of Lynn Haven is located in central Bay County in the central portion of the Florida Panhandle and is completely surrounded by the unincorporated areas of Bay County. Located on the southern shore of North Bay, the city is about 6 square miles in area. It borders Lynn Haven, Anderson, and Upper Goose Bayous. In 1980, the population was reported to be 6,239 (Reference 1).

Highways that serve this city are State Roads 390, A390, and 389. A spur line of the Atlanta and St. Andrews Bay Railroad provide freight service. One cross-country bus line serves the area. Air travel is available at the nearby Panama City Airport.

The topography of the area is rather flat, with a gradual rise in elevation from the waterfront. Most city elevations are between 10 and 20 feet mean sea level (msl). Vegetation consists primarily of pine and soft-wood forests.

The climate of Lynn Haven is subtropical, with a moderating influence from the Gulf of Mexico. The average daily normal temperature varies from 55 degrees Fahrenheit (F.) in January to 82 degrees F. in August. The average annual precipitation is 57.6 inches (Reference 2).

2.3 Principal Flood Problems

Lynn Haven is subject to flooding from tidal surges associated with hurricanes. Located on the shore of North Bay, Lynn Haven has some protection from the barrier islands and the land area to the south. Tidal flooding can occur directly along the bay shore. Lesser flooding may occur from rainfall.

Figure 2 shows the tracks of hurricanes affecting the Florida Panhandle from 1877 to 1975.

The basic information on hurricane tracks was taken from the maps of North Atlantic tropical cyclone tracks for the years 1871 through 1977, compiled by the National Oceanic and Atmospheric Administration (NOAA) (Reference 3).

Brief notes on the history and damages caused by hurricanes have been abstracted from reports by the U.S. Army Corps of Engineers (References 4 and 5), Garriott (Reference 6), Sumner (Reference 7), and Patterson, Bailey, and Paulhus (Reference 8). Additional information on hurricane history and damages, particularly for recent storms, has been taken from papers published in the Monthly Weather Review. The following lists significant storms that have affected the panhandle in this century. Damage figures are those determined for values at the time of the storm. No attempt has been made to adjust these figures to present day values.

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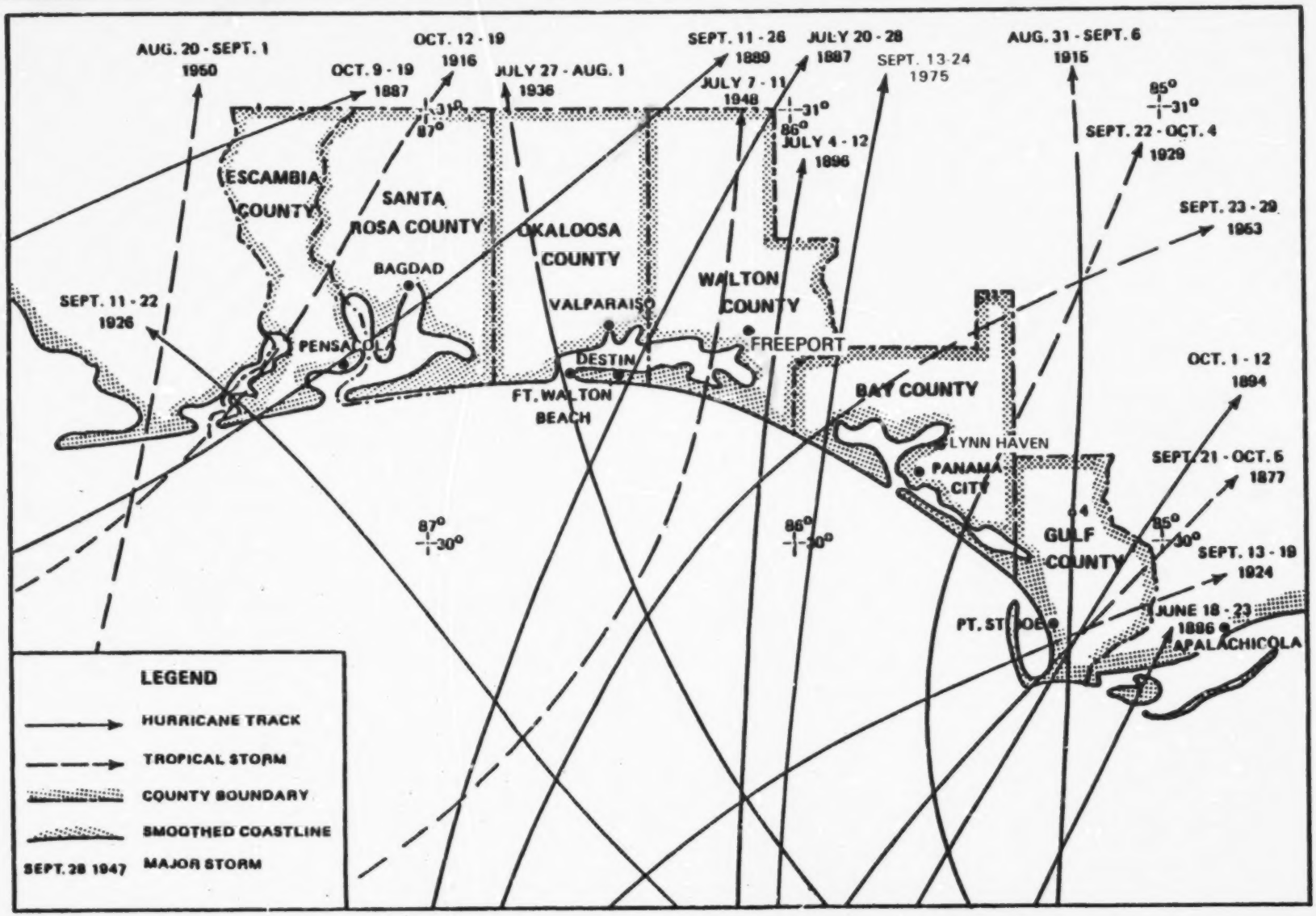

FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LYNN HAVEN, FL

(BAY CO.)

HISTORICAL STORM TRACKS

4

BAY COUNTY AND VICINITY

September 13 to September 19, 1924

Crossing the shoreline near Port St. Joe, this storm caused damage estimated at $275,000. Winds of 80 mph were recorded at Panama City, Florida.

September 21 to October 4, 1929

The center of this storm entered the coast near Panama City. Damage from the storm was estimated at $500,000.

July 27 to August 1, 1936

The center of this storm passed over Fort Walton Beach and Valparaiso. Damage was estimated at $150,000. Tide levels of 7 to 8 feet msl were recorded at Destin. A high-water mark of 8.4 feet msl was reported at Fort Walton Beach.

August 20 to September 1, 1956 (Hurricane Baker)

The center of this storm entered the coast between Pensacola, Florida, and Mobile, Alabama, with damage estimated at $550,000. Tide levels recorded during the passage of this storm include 4.5 feet msl at Pensacola and Carrabelle, Florida; 5 feet msl at Panama City; and, 6.8 feet msl at Apalachicola, Florida.

September 23 to September 28, 1953 (Hurricane Florence)

This storm made landfall between Panama City and Fort Walton Beach with damage estimated at $150,000.

September 21 to September 30, 1956 (Hurricane Flossy)

This was a major hurricane that caused extensive damage along the Louisiana, Mississippi, and Alabama coasts. Total damage was estimated at $25 million. Tide levels of 5.5 feet msl were recorded at Fort Walton Beach. Tides at Destin were estimated at 6 to 7 feet msl.

June 14 to June 22, 1972 (Hurricane Agnes)

This storm made landfall near Panama City. Tide levels of 8 to 9 feet msl were recorded at several points from St. George Island to Pensacola.

August 31 to September 6, 1915

This storm made landfall near Port St. Joe with the heaviest damage occurring to the east near Apalachicola. Damage was estimated to be $40,000. Tide levels of 7.0 feet msl were recorded at Carrabelle.

September 21 to September 29, 1917

This storm made landfall near Fort Walton Beach with damage estimated at $270,000. Tide levels of 7.8 feet msl were recorded at Fort Barrancas, Florida.

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September 13 to September 24, 1975 (Hurricane Eloise)

This storm made landfall about 40 miles west of Panama City. High-water marks ranging from 10 to 18 feet msl were found between Destin and Port St. Joe.

2.4 Flood Protection Measures

There is no extensive construction for flood protection in the community. A few individuals have built private bulkheads, and some of the new homes are being built with a high, first floor elevation.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Analyses were carried out to establish the peak elevation-frequency relationships for each flooding source studied in detail.

Inundation from North Bay caused by passage of storms (storm surge) was determined by the joint probability method (Reference 9). The storm populations were described by probability distributions of 5 parameters that influence surge heights. These were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on an analysis of observed storms in the vicinity of the City of Lynn Haven. Primary sources of data for this were obtained from "Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States" by the NOAA (Reference 10), and "Meteorologic Considerations Pertinent to Standard Project Hurricane, Atlantic and Gulf Coasts of the United States" (Reference 11). A summary of the parameters used for the area is presented in Table 1, Parameter Values for Surge Elevations.

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CENTRAL PRESSURE DEPRESSION (MILLIBARS)	15.2	24.2	33.2	38.2	49.2	60.2	75.2	79.2
ASSIGNED PROBABILITIES	0.32	0.27	0.06	0.11	0.09	0.08	0.05	0.02
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)	12			24			36	
PROBABILITY	0.23			0.50			0.27	
FORWARD SPEED (KNOTS)	7			13			19	
PROBABILITIES: ENTERING	0.46			0.36			0.18	
DIRECTION OF STORM PATH (DEGREES FROM TRUE NORTH)		138	ENTERING	167		196		225
PROBABILITY		0.25		0.23		0.27		0.25
FREQUENCY OF STORM OCCURENCE (STORM/NAUTICAL MILE/YEAR)	0.002213							

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LYNN HAVEN, FL

(BAY CO.)

PARAMETER VALUES FOR SURGE ELEVATIONS

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For areas subject to flooding directly from North Bay, the FEMA standard storm surge model was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the 5 storm parameters defined previously). By performing such simulations for a large number of storms each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much finer scale wave phenomena, such as wave height or runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (Reference 12).

The storm-surge elevations for the 10-, 50-, 100-, and 500-year floods have been determined for the City of Lynn Haven and are shown in Table 2, Summary of Stillwater Elevations. The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects, and include the contributions from wave action effects.

3.2 Hydraulic Analyses

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines.

The FEMA storm surge model was utilized to simulate the hydrodynamic behavior of the surge generated by the various synthetic storms. This model utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed utilizing grids of 5 statute miles and 1 statute mile, depending on the resolution required.

Underwater depths and land heights for the model grid systems were obtained from topographic mapping at a scale of 1:24000 with a contour interval of 10 feet (Reference 13).

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (Reference 14). This method is based on the following major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70 percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions, such as sand dunes, dikes and seawalls, buildings, and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures prescribed in Reference 14. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

Wave heights were computed along transects (cross-section lines) that were located along the coastal areas, as illustrated in Figure 3, Transect Location Map, in accordance with the "Users Manual for Wave Height Analysis" (Reference 15). The transects were located with consideration given to the

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FLOODING SOURCE AND LOCATION	TRANSECT	STILLWATER ELEVATION (FEET NGVD)			
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)
NORTH BAY					
Along shoreline in the vicinity of Haven Point	1	3.1	5.2	5.9	7.3
Along shoreline in the vicinity of Upper Goose Bayou	2	3.1	5.2	5.9	7.3

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LYNN HAVEN, FL

(BAY CO.)

SUMMARY OF STILLWATER ELEVATIONS

NORTH BAY

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FIGURE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LYNN HAVEN, FL

(BAY CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

10

TRANSECT LOCATION MAP

physical and cultural characteristics of the land so that they would closely represent conditions in their locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at large intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects.

Each transect was taken perpendicular to the shoreline and extended inland to a point where wave action ceased. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for the 100-year flood were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the transects. The location of the 3-foot breaking wave for determining the terminus of the V zone (area with velocity wave action) was also computed at each transect. Table 3 provides a listing of the transect locations and stillwater starting elevations, as well as initial wave crest elevations.

Figure 4 represents a sample transect that illustrates the relationship between the stillwater elevation, the wave crest elevation, the ground elevation profile, and the location of the A/V zone boundary.

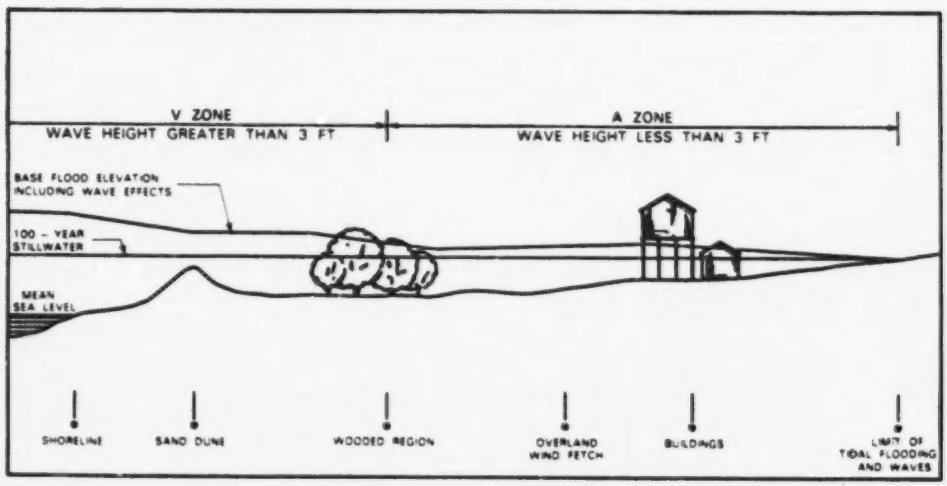

FIGURE 4 - Transect Schematic

After analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic maps (Reference 16), aerial photographs (Reference 17), and engineering judgment. Controlling features affecting the elevations were identified and considered in relation to their positions at a particular transect and their variation between transects.

All elevations are referenced to the National Geodetic Vertical Datum of 1929.

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TABLE 3 - TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS

Transect	Location	Elevation (Feet) Stillwater	Wave Crest
1	about 1,600 feet southwest of Haven Point at North Bay	5.9	8.8
2	about 1,500 feet south of Little Oyster Bar Point at North Bay	5.9	8.2

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each flooding source studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each transect. Between transects, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 2 meters (Reference 16).

The approximate boundaries were taken from the Type 15 Flood Insurance Study for the Unincorporated Areas of Bay County, Florida (Reference 18).

Flood plain boundaries are indicated on the Flood Insurance Rate Map. On this map, the 100-year flood plain boundary corresponds to the boundary of the areas of special flood hazards (numbered A zones and numbered V zones) and the 500-year flood plain boundary corresponds to the boundary of areas of moderate flood hazards (Zone B). In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting the City of Lynn Haven.

5.1 Reach Determinations

In coastal areas, reaches are limited to the distance for which the 100-year flood elevation does not vary more than 1.0 foot. The locations of these reaches are shown on the Flood Insurance Rate Map and are summarized in Table 4, Coastal Flood Insurance Zone Data.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then used with depth-damage relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for areas subject only to storm surge flooding is the difference between the 10- and 100-year stillwater elevations rounded to the nearest 0.5 foot, multiplied by 10, and shown as a 3-digit code. For areas with wave heights less than 3 feet, the FHF is the weighted average difference

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between the 100-year wave crest elevation and the 10-year stillwater elevation. For areas with wave heights greater than 3 feet, the FHF is determined using the difference between the 10- and 100-year stillwater elevations multiplied by 1.55, then rounded to the nearest 0.5 foot, multiplied by 10, and shown as a 3-digit code.

For example, if the difference between elevations is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference is greater than 10.0 feet, it is rounded to the nearest whole foot.

5.3 Flood Insurance Zones

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is associated with each possible FHF and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.
Zones A7, A8:	Special Flood Hazard Areas inundated by the 100-year flood, with base flood elevations shown, and zones subdivided according to FHFs.
Zone V9:	Special Flood Hazard Areas along coasts inundated by the 100-year flood that have additional velocity hazards associated with waves of 3-foot amplitude or greater, with base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- and 500-year floods by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and, areas subject to 100-year flooding from sources with drainage areas of less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding; not subdivided.

Flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are shown in Table 4, Coastal Flood Insurance Zone Data.

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FLOODING SOURCE	TRANSECT	PANEL[1]	ELEVATION DIFFERENCE[2,3] BETWEEN 1.0% (100-YEAR) FLOOD AND 10% (10-YEAR)	FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3,4] (FEET NGVD)
NORTH BAY	1	0005	−4.3 −3.5	045 035	V9 A7	8– 9 6– 8
	2	0005	−4.3 −4.0	045 040	V9 A8	8 6– 8

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE IN FEET
[3]ROUNDED TO NEAREST FOOT
[4]DUE TO MAP SCALE LIMITATIONS, BASE FLOOD ELEVATIONS SHOWN ON MAP MAY REPRESENT AVERAGE ELEVATIONS FOR ZONES DEPICTED
[5]INCLUDES EFFECTS OF WAVE ACTION

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LYNN HAVEN, FL

(BAY CO.)

COASTAL FLOOD INSURANCE ZONE DATA

NORTH BAY

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5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Lynn Haven is, for insurance purposes, the principal product of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations. For each flooding source, the expected water-surface elevations of the base (100-year) flood are shown as a weighted average within zones. Each whole-foot elevation is delineated except where cartographic considerations require the combination of two or more elevation zones. The base flood elevations and zone numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the National Flood Insurance Program.

6.0 OTHER STUDIES

A Flood Insurance Study is currently in progress for the Unincorporated Areas of Bay County (Reference 19). The results of this Flood Insurance Study agree with the Bay County Flood Insurance Study.

Due to its more detailed analysis, this Flood Insurance Study supersedes the previously printed Flood Insurance Rate Map for the City of Lynn Haven (Reference 20).

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

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